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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/875,501	06/04/2001	Klaus Florian Schuegraf	MI22-1741	6564

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EXAMINER

ORTIZ, EDGARDO

ART UNIT PAPER NUMBER

2815

DATE MAILED: 03/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/875,501	Applicant(s) SCHUEGRAF ET AL.	
	Examiner Edgardo Ortiz	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 45-66 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 45-66 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>12/13/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 45-53 and 55-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang et al. (U.S. Patent No. 6,040,238) in view of Ilg et al. (U.S. Patent No. 6,130,145). With regard to Claim 45, Yang teaches a semi-conductive material substrate (10), the substrate having an upper surface (figure 5), a first layer (16) over the upper surface of the substrate, the first layer comprising polysilicon (column 2, line 65), the first layer being patterned as a portion of a conductive line, a second layer (18) over and physically against the first layer (figure 5), the second layer comprising silicide (column 3, line 1), the second layer being patterned as a portion of the conductive line, the conductive line comprising the first and second layers having a pair of opposing lateral edges (figure 5), a pair of conductively-doped diffusion regions (40) extending into the substrate beside the lateral edges of the conductive line, the conductively doped diffusion regions having upper surfaces corresponding to the upper surface of the substrate and a silicon dioxide layer (32) over and physically against the second layer and no silicon dioxide layer (32) being over and physically against the upper surfaces of the conductively-doped diffusion regions (figure 5).

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Regarding the limitation "*the silicon dioxide layer being formed by oxidizing an upper surface of the second layer during rapid thermal processing of the second layer*", it is noted that this is a product-by-process limitation. A "product by process" claim is directed to the product per se, no matter how actually made, In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Marosi et al, 218 USPQ 289; and particularly In re Thorpe, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

However, Yang fails to teach the claimed dopant concentration on the polysilicon and silicide layers. Ilg discloses a doped metal polycide which includes a polysilicon layer (230) and a metal-silicide layer (240) against the layer of polysilicon, wherein the polysilicon layer is doped to a concentration of about $10 \times E19$ to $5 \times E21$ atoms/cubic cm (column 4, lines 7-17) and wherein the metal-silicide layer is doped to a concentration of about $10 \times E19$ to $5 \times E21$ (column 4, lines 30-42). Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Yang to include the claimed dopant concentration on the polysilicon and silicide layers as

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clearly suggested by Ilg, in order to lower the resistance of the metal-silicide layer and increase device performance (column 4, lines 44-46).

With regard to Claims 46-49, the claims contain product-by-process limitations, which do not structurally or patentably distinguish the claimed invention from that taught by the cited prior art. A "product by process" claim is directed to the product per se, no matter how actually made, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

With regard to Claim 50, a further difference between the claimed invention and Yang is, a metal-silicide layer comprising tantalum. Ilg discloses a doped metal polycide which includes a polysilicon layer (230) and a metal-silicide layer (240) against the layer of polysilicon, wherein the metal-silicide layer comprises tantalum (column 4, lines 32-35). Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Yang to include a metal-

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silicide layer comprising tantalum, as clearly suggested by Ilg, in order to improve the conductivity of the gate electrode stack of the semiconductor transistor.

With regard to Claim 51, a further difference between the claimed invention and Yang is a conductive-enhancing dopant for the second layer that comprises a group III or a group V element other than boron, phosphorous and arsenic. Ilg teaches a silicide layer (240) which is doped using dopants which are p or n type (column 4, lines 35-37). Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Yang to include a conductive-enhancing dopant for the second layer that comprises a group III or a group V element other than boron, phosphorous and arsenic, as clearly suggested by Ilg, since group III and group V elements are commonly known in the semiconductor art.

With regard to Claim 52, a further difference between the claimed invention and Yang is a silicide of the second layer comprising cobalt. Ilg teaches a silicide layer (240) which comprises cobalt (column 4, lines 30-35). Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Yang to include a silicide of the second layer comprising cobalt, as clearly suggested by Ilg, in order to provide a silicide layer comprising a material known in the semiconductor art for its conduction-enhancing properties.

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With regard to Claim 53, Yang teaches a silicon dioxide layer (32) that comprises a dopant barrier layer.

With regard to Claim 55, Yang teaches a semi-conductive material substrate (10), the substrate having an upper surface (figure 5), a first layer (16) over the upper surface of the substrate, the first layer comprising polysilicon (column 2, line 65), the first layer being patterned as a portion of a conductive line, a second layer (18) over and physically against the first layer (figure 5), the second layer comprising silicide (column 3, line 1), the second layer being patterned as a portion of the conductive line, the conductive line comprising the first and second layers having a pair of opposing lateral edges (figure 5), a pair of conductively-doped diffusion regions (40) extending into the substrate beside the lateral edges of the conductive line, the conductively doped diffusion regions having upper surfaces corresponding to the upper surface of the substrate and a silicon dioxide layer (32) over and physically against the second layer and wherein the silicon dioxide layer, second layer and the first layer together are an expanse extending over the substrate and over the oxide isolation regions (figure 5).

However, Yang fails to teach the claimed dopant concentration on the polysilicon and silicide layers and a conductive-enhancing dopant for the second layer that comprises a group III or a group V element other than boron, phosphorous and arsenic. Ilg discloses a doped metal polycide which includes a polysilicon layer (230) and a metal-silicide layer (240) against the layer of polysilicon, the metal-silicide layer doped using dopants which are p or n type

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(column 4, lines 35-37), wherein the polysilicon layer is doped to a concentration of about $10 \times E19$ to $5 \times E21$ atoms/cubic cm (column 4, lines 7-17) and wherein the metal-silicide layer is doped to a concentration of about $10 \times E19$ to $5 \times E21$ (column 4, lines 30-42). Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Yang to include the claimed dopant concentration on the polysilicon and silicide layers as clearly suggested by Ilg, in order to lower the resistance of the metal-silicide layer and increase device performance (column 4, lines 44-46).

With regard to Claims 56-59, the claims contain product-by-process limitations, which do not structurally or patentably distinguish the claimed invention from that taught by the cited prior art. A "product by process" claim is directed to the product per se, no matter how actually made, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

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With regard to Claim 60, Yang teaches a silicon dioxide layer (32) that comprises a dopant barrier layer.

With regard to Claim 61, Yang teaches a semi-conductive material substrate (10), the substrate having an upper surface (figure 5), a first layer (16) over the upper surface of the substrate, the first layer comprising polysilicon (column 2, line 65), the first layer being patterned as a portion of a conductive line, a second layer (18) over and physically against the first layer (figure 5), the second layer comprising silicide (column 3, line 1), the second layer being patterned as a portion of the conductive line, the conductive line comprising the first and second layers having a pair of opposing lateral edges (figure 5), a pair of conductively-doped diffusion regions (40) extending into the substrate beside the lateral edges of the conductive line, the conductively doped diffusion regions having upper surfaces corresponding to the upper surface of the substrate and an oxide layer (32) over and physically against the second layer.

However, Yang fails to teach the claimed dopant concentration on the polysilicon and silicide layers. Ilg discloses a doped metal polycide which includes a polysilicon layer (230) and a metal-silicide layer (240) against the layer of polysilicon, wherein the polysilicon layer is doped to a concentration of about $10 \times E19$ to $5 \times E21$ atoms/cubic cm (column 4, lines 7-17) and wherein the metal-silicide layer is doped to a concentration of about $10 \times E19$ to $5 \times E21$ (column 4, lines 30-42). Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by

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Yang to include the claimed dopant concentration on the polysilicon and silicide layers as clearly suggested by Ilg, in order to lower the resistance of the metal-silicide layer and increase device performance (column 4, lines 44-46).

With regard to Claim 62, Yang teaches an oxide layer comprising a silicon dioxide layer (column 3, line 42).

With regard to Claims 63-65, the claims contain product-by-process limitations, which do not structurally or patentably distinguish the claimed invention from that taught by the cited prior art. A "product by process" claim is directed to the product per se, no matter how actually made, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

With regard to Claim 66, a further difference between the claimed invention and Yang is a conductive-enhancing dopant for the second layer that comprises a group III or a group V element other than boron, phosphorous and arsenic. Ilg teaches a silicide layer (240) which is

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doped using dopants which are p or n type (column 4, lines 35-37). Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Yang to include a conductive-enhancing dopant for the second layer that comprises a group III or a group V element other than boron, phosphorous and arsenic, as clearly suggested by Ilg, since group III and group V elements are commonly known in the semiconductor art.

Response to Amendment

2. The amendment filed December 12, 2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states, that no amendment shall introduce new matter into the disclosure of the invention. The added material, which is not supported by the original disclosure is as follows: Claims 54 and 58 include the new limitation “*the silicon dioxide layer comprises a thickness less than half a thickness of the second layer*”. And claim 61 includes the new limitation “*an oxide layer comprises a thickness less than half a thickness of the second layer*”.

Applicant is required to cancel the new matter in the reply to this Office Action.

Response to Arguments

3. Applicant's arguments have been fully considered but are not deemed persuasive for the reasons stated in the body of the office action. Applicant first argues that “*Ilg fails to teach rapid thermal annealing, and an electronic search verifies this assertion*”, however the examiner notes that, as stated in the rejection, the limitation “*the silicon dioxide layer being formed by oxidizing*

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an upper surface of the second layer during rapid thermal processing of the second layer”, is a product-by-process limitation which does not structurally or patentably distinguish the claimed invention from that taught by the prior art.

Applicant further argues that *“the art of record, singularly or in any combination, fails to teach or suggest a silicon dioxide layer comprises a thickness less than half a thickness of a second layer as positively recited in claim 54”*. As noted above this limitation, which is also included in claims 58 and 61, is not supported by the specification and thus this argument is moot.

Lastly, Applicant argues that Ilg *“fails to teach the conductive-enhancing dopant for the second layer comprises a group III or a group V element other than boron, phosphorous and arsenic as positively recited in claim 55”*. The examiner notes that, as stated in the rejection, Ilg teaches a silicide layer (240) which is doped using dopants which are p or n type (column 4, lines 35-37), and thus the teaching of the dopants as claimed is clearly suggested by Ilg.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

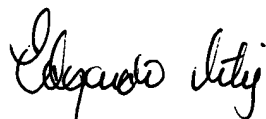
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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edgardo Ortiz whose telephone number is 571-272-1735. The examiner can normally be reached on Monday-Friday (1st Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 571-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



E.O.

A.U. 2815

3/15/04



ALLAN R. WILSON
PRIMARY EXAMINER